INFORMS 2001

ATS
Cost Accounting System
Power for Decision-Making

Getting a Grip on the Cost of ATC Services

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- Responsible for the safe and efficient movement of aircraft throughout the National Airspace System
- Approx. $6 Billion/year and 36,000 employees
- Over 500 service delivery points and more than 50,000 pieces of equipment
- Workforce with diverse skills: controllers, engineers, maintenance technicians, pilots

The FAA's new Cost Accounting System (CAS)

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- Fully operational in April 2001
- Attributes all relevant FAA expenditures to 21 En Route Centers, 482 Terminal facilities, 61 Automated Flight Service Stations, and 5 Oceanic operations every month
- Tracks full costs of operation from service level to particular equipment sites
  - Direct costs
  - Overhead costs
  - Capital costs
  - "Book adjustments"
- Will provide life cycle cost data on capital projects as historical data accumulates

Cost variability between En Route Centers

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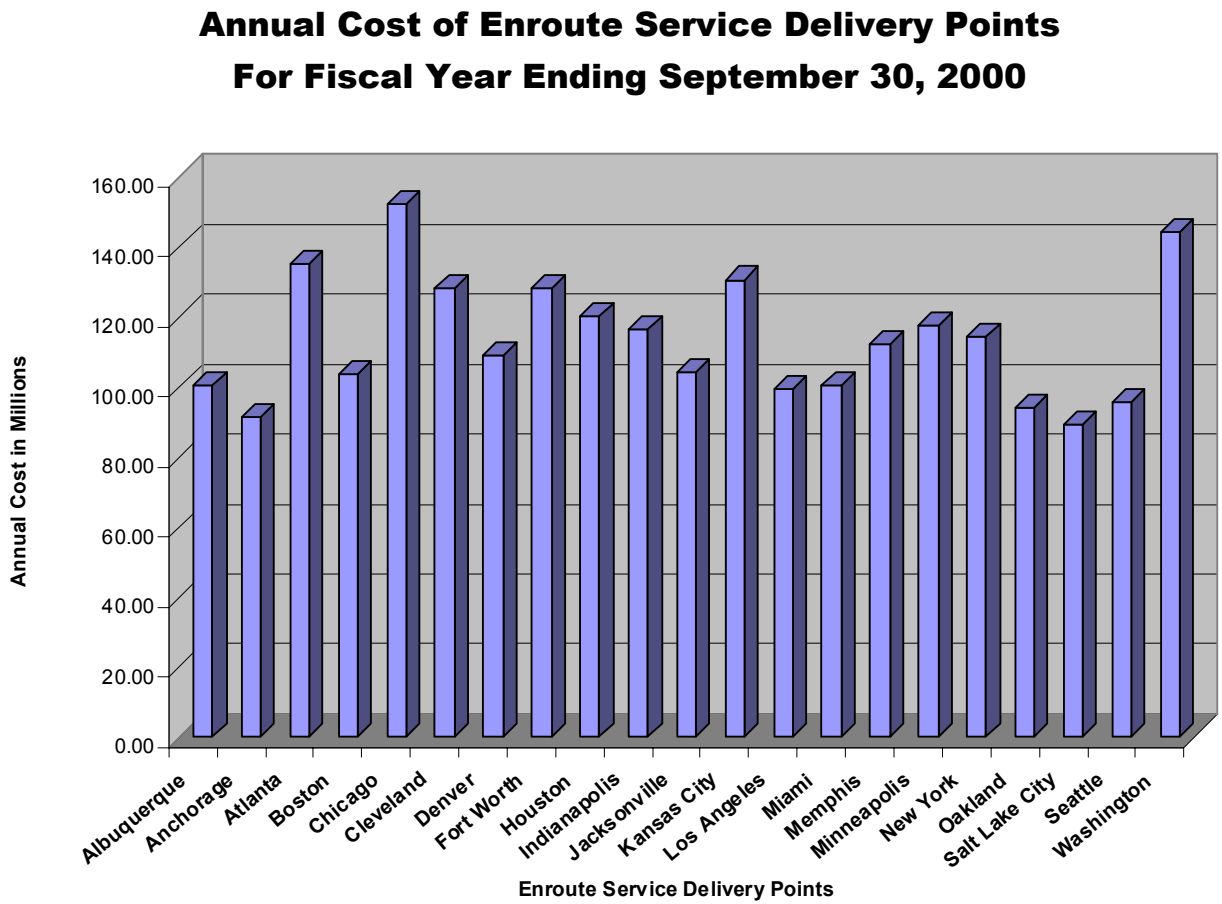

Statistical model issues

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- Which facilities can be grouped based on similar production costs/components?
- What measures of output and performance best explain cost variations?
- How do trends vary over time?
- Do production costs vary by service or user type?
- Are there other factors that explain cost differences (e.g. facility level, Alaska)?
- How do cost accounting data and analytical models differ from budget tracking?

Analyzing CAS data

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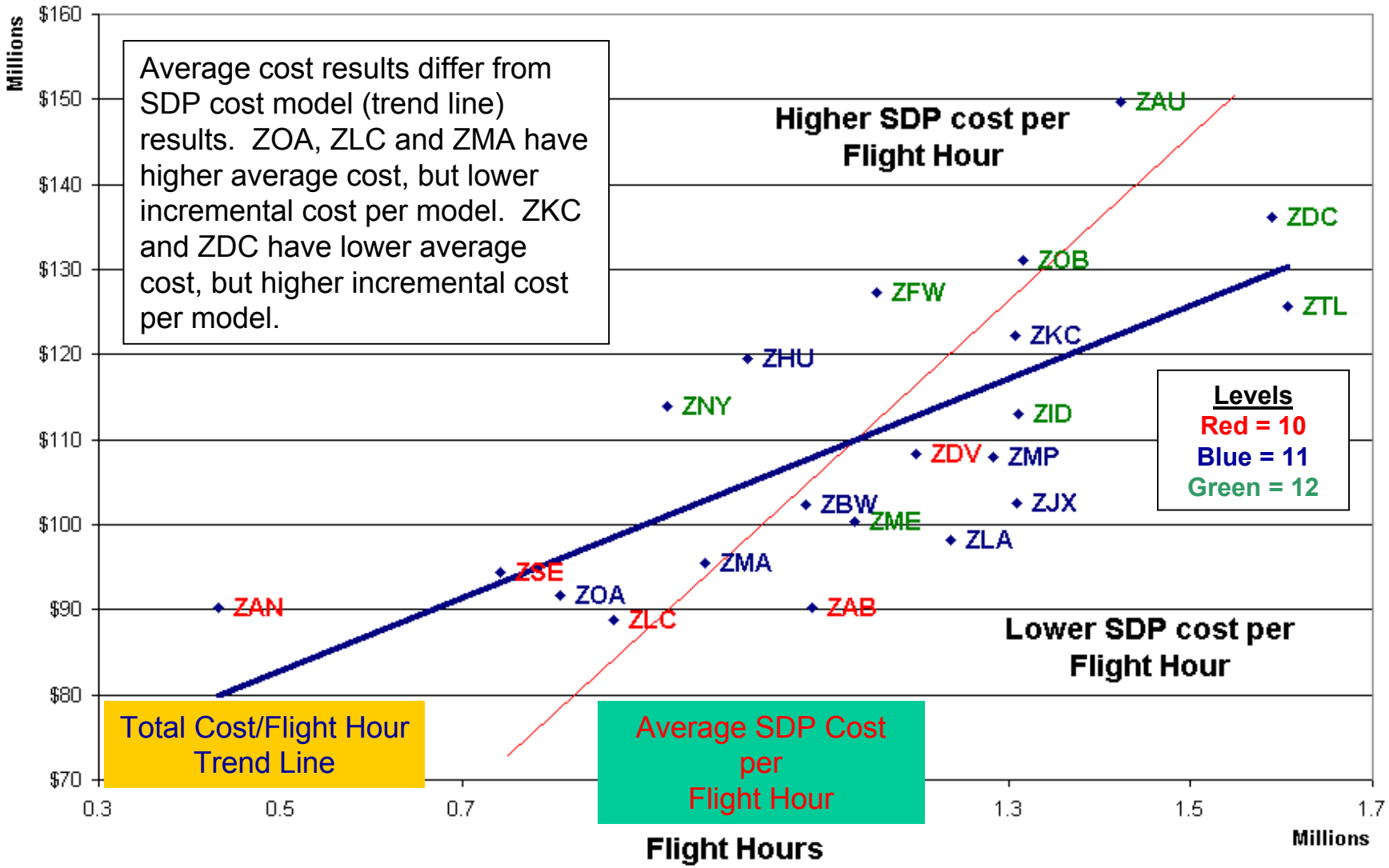
- Simple average based on activity
  - What metrics are appropriate for CAS cost components?
  - How well do averages reflect cost variability?
- Bivariate statistical cost models
  - Cost as a function of one metric
  - How well does a single measure reflect total en route costs and components?
  - Isolates incremental and fixed costs
- Multivariate statistical cost models
  - Cost as a function of multiple measures
  - Different explanatory variables to reflect differences in production
  - End up with multiple cost drivers
  - Isolates incremental and fixed costs
  - More complex to explain to executives

Total En Route Costs and Flight Hours



Only En Route ATO costs vary with activity

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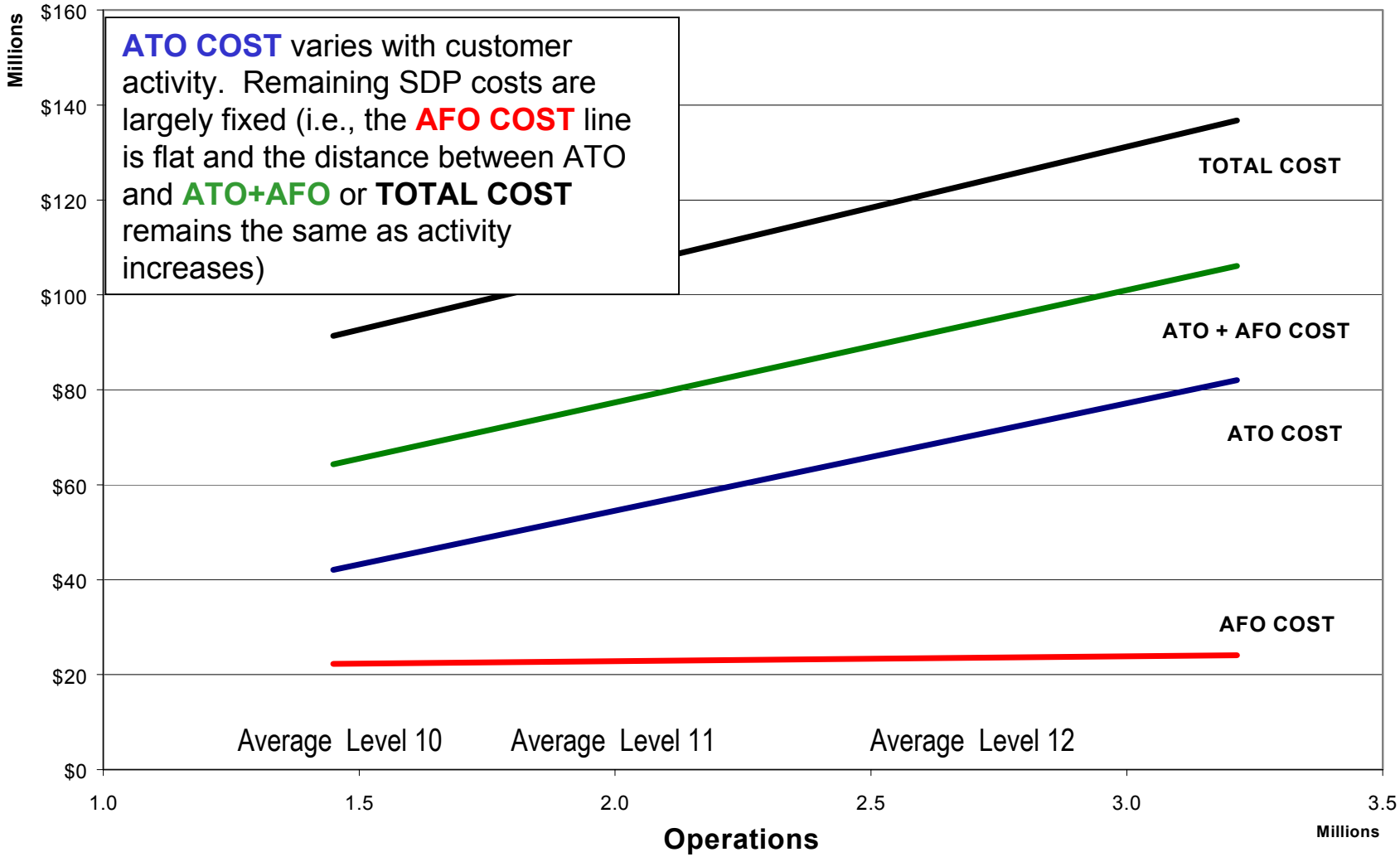

Statistical analysis of CAS data

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Cost Models:
A Regression Based approach to isolate those factors that affect costs

Cost Assignments	=	*Activity*	+	*Attributes*	+	*SDP Characteristics*
• Total • **ATO** • **AFO** • **Direct** • **Variable** • **Direct/Variable**		• **Hours** • Miles • **Operations** • **Departures** • **Overs** • By user		• **FY** • Cost of living • Alaska		• **Facility level** • **No. of sectors** • **Complexity** • # per region • FSEP count • **NAPRS count** • **Departure %**

*Variables in **Bold** had most significant results*

Total cost flight hours model results

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Model		All SDP's		
Variable	Coefficient	Units	Estimated Cost ($mil)	Pct. of SDP
Constant	$44,961,600	21	$944.2	40.9%
Flight Hours	$36.28	23,773,600	$862.6	37.4%
Year 2000	$8,378,680	21	$176.0	7.6%
Level 12*	$9,464,280	8	$75.7	3.3%
Alaska	$14,700,900	1	$14.7	0.6%
Complexity**	$96,814.20	2,436	$235.8	10.2%
Total Estimated Cost			$2,309.0	
FY2000 CAS Total SDP Cost			$2,309.0	100.0%

*0 = Level 10 and 11; 1 = Level 12

**Complexity is a measure created by multiplying the number of terminal facilities underlying an SDP by their level.

Note: Model estimated with FY 1999 and 2000 data.

All coefficients are significant; only 37% of costs vary with activity. Adjusted $R^2 = 0.76$.

ATO flight hours cost model results

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Model		All SDP's		
Variable	Coefficient	Units	Estimated Cost ($mil)	Pct. of SDP
Constant	$3,813,247.56	21	$ 80.1	7%
Flight Hours	$33.42	23,773,596	794.5	66%
Year 2000	$3,475,875.00	21	73.0	6%
Level 12 Facility*	$9,608,470.13	8	76.9	6%
Complexity**	$75,347.55	2,436	183.5	15%
Total Estimated Cost			$ 1,208.0	
FY2000 CAS SDP ATO Cost			$ 1,208.0	100%

*0 if Level 10 or 11; 1 if Level 12
**Complexity is created by multiplying the number of terminal facilities underlying an en route SDP by the level of those facilities. Note: Model estimated with FY 1999 and 2000 data.

All coefficients are significant except constant; adjusted $R^2 = 0.91$.
Two-thirds of costs vary with activity; complexity also important.

AFO flight hours cost model results

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Model		All SDP's		
Variable	Coefficient	Units	Estimated Cost ($mil)	Pct. of SDP
Constant	$ 3,851,266	21	$ 80.9	17%
Flight Hours	$ 3.47	23,773,596	82.6	17%
Level 12 Facility*	$ 1,594,107	8	12.8	3%
Percent Departures**	$ 21,859,637	21 units @ 38%	173.7	36%
NAPRS Facilities	$ 22,828	5,865	133.9	28%
Total Estimated Cost			$ 483.8	100%
FY2000 CAS SDP AFO Cost			$ 481.7	

*0 if Level 10 or 11; 1 if Level 12
**Percent of departures to total operations; a measure of how much traffic originates or terminates within the SDP.

All coefficients are significant except constant;adjusted $R^2 = 0.63$.
Most of costs explained by percent departures to operations (a measure of complexity) and number of NAPRS facilities.

Eurocontrol/FAA En Route Service Comparison

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- First international ATC benchmarking effort
- Compared multiple parameters:
  - General aspects (airspace size, demand, complexity)
  - Organizational aspects (facilities, controllers, sectors)
  - Civil/military relationship
  - Traffic activity
  - Safety
  - Delays
  - Air navigation service costs
  - Staff resources
- Developed high level indicators

Findings

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- No significant differences in safety, delays, staffing
- Structurally similar - airspace volume, traffic concentration, route lengths
- U.S. traffic volume is twice that of Europe (IFR)
- U.S. has significantly less en route facilities than Europe (21 versus 58)
- U.S. is twice as cost effective as its European counterpart
- Additional in-depth analysis is underway to investigate apparent productivity differences